PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	IRANPOUR KAMBIZ JAMES MARTIN	Confirmation:	4407
		Group Art Unit:	3662
Serial No.:	10/529,192	Examiner:	Ian Lobo
Filed:	Oct. 12, 2005	Atty. Docket:	2088.007000
For: Acoustic Ranging By Application Of Linear Period Modulated Sound		Client Docket:	14.0195 PCT US

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby submit this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated April 2, 2008, and the Notice of Appeal filed on August 4, 2008. The fee for filing this Appeal Brief is $540, and the Commissioner is authorized to deduct said fees from Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/2088.007000.

I. REAL PARTY IN INTEREST

The real party in interest is WesternGeco, LLC, a wholly owned subsidiary of Schlumberger, Inc.

II. RELATED APPEALS AND INTERFERENCES

Applicants, Applicants' representative(s), and the Assignee are not aware of any appeals, interferences, or judicial proceedings that are related to, may be affected by, might affect. or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-5, 7-21, and 23-27 are pending in the case, claims 6 and 22 having been canceled. The "final" Office Action objected to claims 10-13, 25 and 26 and rejected each of claims 1-27 on various grounds. More particularly, the "final" Office Action rejected:

- claims 10-13, 25 and 26 under 35 U.S.C. §112, ¶2, as indefinite for referring to a canceled claims;
- claims 1, 4-5, 7-9, 14-17, 20-21, 23-24, and 27 as anticipated under 35 U.S.C. §102(b) by U.S. Letters Patent 5,359,575 ("Williams");
- claims 2-3 and 18-19 as obvious under 35 U.S.C. §103(a) over Williams in combination with "Radar/Sonar Acceleration Estimation with Linear Period Modulated Waveforms" by R. A. Altes ("Altes") and "Own Doppler Nullification (ODN) in Sonars Using Linear Period Modulated (LPM) Wideband Signals" by Ashley, *et al.* ("Ashley").

Applicants herein appeal from the anticipation and obviousness rejections set forth above. Accordingly, Applicants expressly identify the claims in this appeal as claims 1-5, 7-21, and 23-27.

IV. STATUS OF AMENDMENTS

An amendment was filed June 3, 2008, as to matters of form subsequent to the "final" Office Action dated April 2, 2008. More particularly, Applicants sought to amend the dependencies of claims 10-13 and 25-26 from canceled claims 6 and 22, respectively, to claims 1 and 17, respectively. The Advisory Action mailed June 13, 2008, did not address this amendment. Since an Examiner's express approval is required for entry of amendments after a "final" rejection, Applicants presume the amendment was not entered. However, Applicants do not challenge that ground of rejection in this appeal, and propose that the issue be dealt with on remand to the Examiner.

V. SUMMARY OF CLAIMED SUBJECT MATTER

This section presents a simplified summary of the invention as required by the Rules of Practice and in order to provide a basic understanding of some aspects of the invention as is

required by the Rules of Practice. This summary is not an exhaustive overview of the invention. Its sole purpose is to present some concepts in a simplified form as a prelude to the more detailed description that is discussed later.

This invention relates generally to acoustic ranging, and, more particularly, to acoustic ranging by the application of linear period modulated sound. ¶[0001] The following discussion may be broken into three parts. First, there is a brief summary of the technology and issues associate therewith. Second, a brief summary of the invention with reference to the drawings is provided. Third, the language of the independent claims themselves is related to the specification and drawings. References herein are to the application as published.

A. RELATED ART AND ISSUES

This section of this document introduces various aspects of the art that may be related to various aspects of the present invention as claimed. It provides background information to facilitate a better understanding of the various aspects of the present invention. As the section's title implies, this is a discussion of related art. That such art is related in no way implies that it is also prior art. The related art may or may not be prior art. It should therefore be understood that the following statements are to be read in this light, and not as admissions of prior art.

Underwater seismic exploration is widely used to locate and/or survey subterranean geological formations for hydrocarbon deposits. ¶[0002] A survey typically involves deploying one or more seismic sources and one or more seismic sensors at predetermined locations. ¶[0002] The seismic sources generate acoustic waves that travel to the geological formations, where they are reflected and propagate back to the seismic sensors. ¶[0002] The seismic sensors receive the reflected waves, which are then processed to generate seismic data. ¶[0002] Analysis of the seismic data may indicate probable locations of geological formations and hydrocarbon deposits. ¶[0002] However, the accuracy of the seismic analysis may be limited by uncertainties in the seismic source and sensor positions during the survey. ¶[0002]

B. BRIEF DESCRIPTION OF THE INVENTION

FIG. 1A- FIG. 1B, reproduced below, depict a first exemplary system 100 for acoustic ranging. ¶[0015] The exemplary system 100 includes a survey vessel 105, a source 110, and a

seismic cable 115. ¶[0015] The source 110 may be deployed in any desirable manner at or near the surface 120 of the body of water 142. ¶[0015] The seismic cable 115 deployed from the survey vessel 105 includes one or more sensors 125. ¶[0016] The sensors 125 receive a variety of signals, including, but not limited to acoustic signals, seismic signals (not shown), and the like. ¶[0016] In the illustrated embodiment, as the seismic cable 115 is being deployed, it descends through the catenary until it reaches the floor 140 of the body of water 142 as is shown in **FIG. 1B**. ¶[0016]

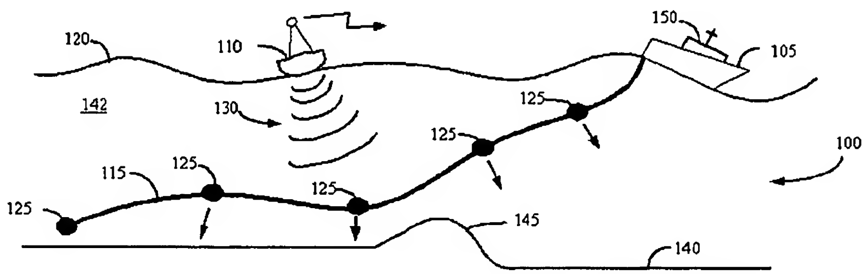

Figure 1A

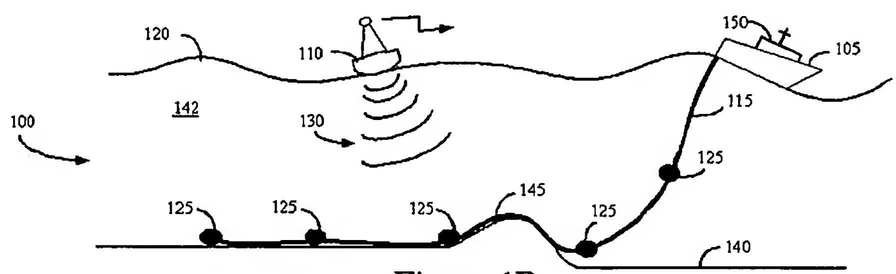

Figure 1B

The size and shape of the seismic cable 115, currents in the body of water 142, and other like factors may influence the descending path through the catenary. ¶[0017] Similarly, irregularities, such as a bump 145 shown in **FIG. 1A- FIG. 1B**, may influence the position of the seismic cable 115 as it rests upon the floor 140. ¶[0017] The conditions in the water 142, as well as the geometry of the floor 140, may not be known in advance. ¶[0018] This causes uncertainty in the position of, for example, the sensors 125.

To determine the position of the seismic cable 115, the source 110 generates at least one acoustic signal 130 that is received by the sensors 125. ¶[0019] The received signal and the acoustic signal 130 may then be communicated to a signal processing unit 150. ¶[0019] The signal processing unit 150 forms a cross-correlation coefficient by cross-correlating the received

signal and the acoustic signal 130. ¶[0020] A peak in the cross-correlation coefficient corresponding to a propagation time lag may be used to determine the location of the seismic cable 115. ¶[0020]

Movement of the source 110, the survey vessel 105, the cable 115, and/or the sensors 125 may make it difficult to cross-correlate the received signal and the acoustic signal 130. ¶[0021] In particular, the movement may Doppler shift the frequencies of the received signal and/or the acoustic signal 130 and degrade the correlation coefficient. ¶[0021] In some instances, the Doppler shift may degrade the cross-correlation to such an extent that it may not be possible to determine the position of the seismic cable 115. ¶[0022]

Thus, the source 110 provides at least one Doppler invariant acoustic signal 130. ¶[0022] **FIG. 3A**, reproduced below, shows a Doppler invariant signal 300, in accordance with one embodiment of the present invention. ¶[0028] The Doppler invariant signal 300 shown in the illustrated embodiment is a so-called liner-period-modulated ("LPM") chirp. ¶[0028] The instantaneous frequency of the LPM chirp 300 decreases linearly with time *t* and, consequently, the instantaneous period of the LPM chirp 300 increases linearly with time *t*. ¶[0029] **FIG. 3B**, also reproduced below, shows the frequency spectrum 310 of the LPM chirp 300. ¶[0029] In the illustrated embodiment, the bandwidth of the LPM chirp 300 is about 16 kHz and the duration of the LPM chirp 300 is about 4 seconds. ¶[0029]

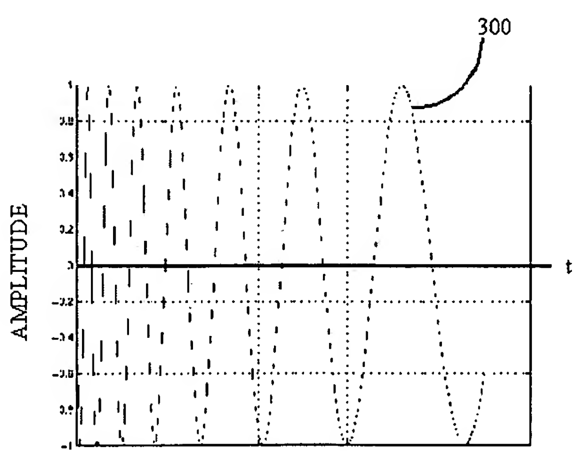

Figure 3A

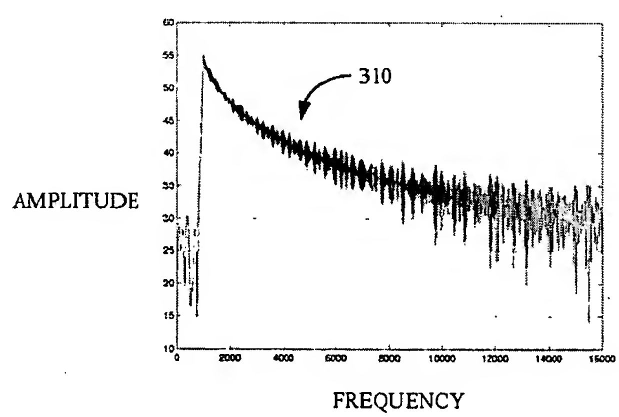

Figure 3B

Referring again to **FIG. 1A - FIG. 1B**, the source 110 generates a plurality of Doppler invariant acoustic signals 130. ¶[0031] Each of the plurality of Doppler invariant acoustic signals 130 may be modulated in some embodiments by a sequence to form an orthogonal Doppler invariant acoustic signal 130 that may be transmitted and/or received while other orthogonal Doppler invariant acoustic signals 130, 215 are also being transmitted and/or received. ¶[0031] In one embodiment, a Maximal sequence may be used to form the orthogonal Doppler invariant acoustic signal 130. ¶[0032] In alternative embodiments, any desirable sequence, such as a Kasami sequence, may be used as the envelope function to form the orthogonal Doppler invariant acoustic signals 130. ¶[0032]

Accordingly, **FIG. 4**, reproduced below, shows a method of acoustic ranging, in accordance with one embodiment of the present invention. ¶[0034] The source 110 generates (at 400) the Doppler invariant acoustic signal 130. ¶[0034] If it is determined (at 410), that it is desirable to provide one or more orthogonal Doppler invariant acoustic signals 130, then the Doppler invariant acoustic signal 130, 215 may be modulated (at 420) by an orthogonal sequence. ¶[0034] For example, as discussed above, the Doppler invariant acoustic signal 130 may be modulated by a Maximal sequence, a Kasami sequence, and the like. ¶[0034] The Doppler invariant acoustic signals 130 are then provided to the sensors 125. ¶[0034]

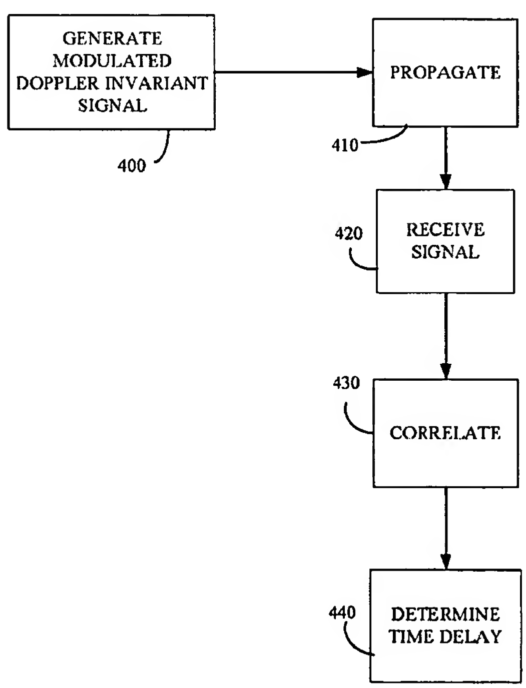

Figure 4

The sensors 125 and/or the transceivers 210 receive (at 430) the Doppler invariant acoustic signals 130, 215. ¶[0035] If it is determined (at 440) that the Doppler invariant acoustic signals 130, 215 are modulated by an orthogonal sequence, the orthogonal Doppler invariant acoustic signals 130, 215 may be demodulated (at 450) in a manner well known to those of ordinary skill in the art having benefit of the present disclosure. ¶[0035] The Doppler invariant acoustic signals 130, 215 are then provided to the signal processing unit 150, which determines (at 460) the distances between the source 110, the sensors 125, and/or the transceivers 210, as discussed in detail above. ¶[0035]

By using a Doppler invariant signal 130, 215, or a plurality of orthogonal Doppler invariant signals 130, 215, in the manner described above, the performance of acoustic ranging systems, such as the first exemplary system 100 and the second exemplary system 200, may be improved. ¶[0036] For example, up to 100% of the LPM chirps 300 may be used to calculate the cross-correlation coefficient during acoustic ranging in rough seas having at least a significant wave height ("SWH") of about 8 meters, which may accelerate a buoy or vessel to velocities of at least about 2-3 meters per second. ¶[0036]

C. THE CLAIMS AS RELATED TO THE SPECIFICATION

With respect to the language of the claims, **claims 1 and 17 are independent**. With respect to **claim 1**, an apparatus (*e.g.*, 100, **FIG. 1A-FIG. 1B**; 200, **FIG. 2A-FIG. 2B**; ¶[0015]-¶[0020]; ¶[0023]-¶[0027]) for determining a propagation time delay (*e.g.*, 175, **FIG. 1C**, ¶[0021]), the invention comprises:

- at least one source (*e.g.*, 110, **FIG. 1A-FIG. 1B**; 210, **FIG. 2A-FIG. 2B**; ¶[0015], ¶[0024]) adapted to generate a plurality of separable, modulated Doppler invariant signals (*e.g.*, 130, **FIG. 1A-FIG. 1B**; 215, **FIG. 2A-FIG. 2B**; ¶[0028]-¶[0033]);
- at least one receiver (*e.g.*, 125, **FIG. 1A-FIG. 1B**; 210, **FIG. 2A-FIG. 2B**; ¶[0017], ¶[0024]) deployed along a seismic sensing cable (*e.g.*, 115, **FIG. 1A-FIG. 1B**; 205, **FIG. 2A-FIG. 2B**; ¶[0016], ¶[0024]), wherein the receiver is adapted to receive at least one modulated Doppler invariant signal from the at least one source; and

- a signal processing unit (*e.g.*, 150, **FIG. 1A-FIG. 1B**, **FIG. 2A-FIG. 2B**; ¶[0019]) adapted to determine the propagation time delay between the source and the receiver using the modulated Doppler invariant signal and the received modulated Doppler invariant signal.

With respect to **claim 17**, the invention includes a method for determining a propagation time delay, the method comprising:

- generating (*e.g.*, at 400, **FIG. 4**, ¶[0028]-¶[0034]) a plurality of separable, modulated Doppler invariant signals (*e.g.*, 130, **FIG. 1A-FIG. 1B**; 215, **FIG. 2A-FIG. 2B**; ¶[0028]-¶[0033]) using at least one source (*e.g.*, 110, **FIG. 1A-FIG. 1B**; 210, **FIG. 2A-FIG. 2B**; ¶[0015], ¶[0024]);
- receiving (*e.g.*, at 420, **FIG. 4**; ¶[0035]) the at least one modulated Doppler invariant signal with at least one receiver positioned along a seismic cable; and
- determining (*e.g.*, at 440, **FIG. 4**; ¶[0020]-¶[0021], ¶[0035]) at least one propagation time delay from the source to the receiver using the modulated Doppler invariant signal and the received Doppler invariant signal.

There are no "means-plus-function" or "step-plus-function" limitations in the claims. Note that the references in parentheses are not limitations in the claims but relate the claim language to Applicant's disclosure in compliance with the Rules of Practice.

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1, 4-5, 7-9, 14-17, 20-21, 23-24, and 27 are anticipated under 35 U.S.C. §102(b) by U.S. Letters Patent 5,359,575 ("Williams").

B. Whether claims 2-3 and 18-19 are obvious under 35 U.S.C. §103(a) over Williams in combination with "Radar/Sonar Acceleration Estimation with Linear Period Modulated Waveforms" by R. A. Altes ("Altes") and "Own Doppler Nullification (ODN) in Sonars Using Linear Period Modulated (LPM) Wideband Signals" by Ashley, *et al.* ("Ashley").

VII. ARGUMENT

The final Office Action rejected all pending claims on various grounds. More particularly, the Office Action rejected:

- claims 10-13, and 25-26 under 35 U.S.C. §112, ¶2, as indefinite for referring to a canceled claims;
- claims 1, 4-5, 7-9, 14-17, 20-21, 23-24, and 27 as anticipated under 35 U.S.C. §102(b) by U.S. Letters Patent 5,359,575 ("Williams");
- claims 2-3 and 18-19 as obvious under 35 U.S.C. §103(a) over Williams in combination with "Radar/Sonar Acceleration Estimation with Linear Period Modulated Waveforms" by R. A. Altes ("Altes") and "Own Doppler Nullification (ODN) in Sonars Using Linear Period Modulated (LPM) Wideband Signals" by Ashley, *et al.* ("Ashley").

As noted above, the indefiniteness rejection was addressed by amendment after the "final" rejections, but the status of that amendment is ambiguous. At any rate, Applicants do not challenge that rejection in this appeal. The remaining to rejections are appealed from, and will now be addressed in turn.

A. CLAIMS 1, 4-17, AND 20-27 ARE NOVEL OVER WILLIAMS

The Office rejected claims 1, 4-5, 7-9, 14-17, 20-21, 23-24, and 27 as anticipated under 35 U.S.C. §102(b) by U.S. Letters Patent 5,359,575 ("Williams").The rejections suffer from two flaws. First, the Office has failed to properly establish *prima facie* anticipation for the claims. Second, Williams does not teach all the limitations of the claims.

1. The Office Failed to Properly Establish *Prima Facie* Anticipation <u>by Failing to Identify Limitations as Taught by Williams</u>

"[I]t is incumbent upon the examiner to identify wherein each and every facet of the claimed invention is disclosed in the applied reference." *Ex parte Levy*, 17 U.S.P.Q.2d (BNA) 1461, 1462 (Pat. & Tm. Off. Bd. Pat. App. & Int. 1990). With respect to claims 4-5, 7-16, 20-21, and 23-27, the entire rejection is:

> Dependent claims 4-16 and 20-27 are further anticipated by the structure and method disclosed by Williams *et al.*

("final" Office Action dated April 4, 2008, "Detailed Action", p. 3, ¶3) There is no attempt to map any limitation of any of these claims back into Williams. The Office has therefore failed to establish *prima facie* anticipation for any of claims 4-5, 7-9, 14-16, 20-21, 23-24, and 27.

2. Williams Fails to Disclose All the Limitations of the Claims

An anticipating reference, by definition, must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. M.P.E.P. §2131; *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990). Each of the independent claims 1 and 17 recites "a plurality of separable, modulated Doppler invariant signals". The remaining claims 4-5, 7-9, 14-16, 20-21, 23-24, and 27 incorporate this limitation as a matter of law by virtue of their dependence. 35 U.S.C. §112, ¶4. It is this limitation that Williams fails to teach.

The Office identifies col. 3, lines 64-68 as disclosing "separable, modulated Doppler invariant signals". This passage reads:

> A transmitter portion of the transceiver synthesizes a pulse waveform having preselected characteristics on one of five channels between 50 kHz and 100 kHz. The synthesized pulse is transmitted into the water at a scheduled time through the transducer for reception by one or more of the transceivers.

Thus, the signals described here are "separated"—*i.e.*, separated in time—rather than "separable". In fact, they are separated in time *because they are not "separable."* Compare, for example, the discussion of "separable" in Applicants' disclosure in ¶[0031]:

> Referring back to FIGS. 1A-B and 2A-B, the source 110 and/or the transceivers 210 may generate a plurality of modulated Doppler invariant acoustic signals 130, 215. *In one embodiment, the plurality of modulated Doppler invariant signals 130, 215 are separable*. For example, each of the plurality of modulated Doppler invariant acoustic signals 130, 215 may be modulated by a sequence to form an orthogonal Doppler invariant acoustic signal 130, 215, which may be transmitted and/or received while other orthogonal Doppler invariant acoustic signals 130, 215 are also being transmitted and/or received. ***In particular, the plurality of orthogonal Doppler invariant acoustic signals 130, 215 may be transmitted and/or received simultaneously.***

(emphasis added) There is no indication anywhere in Williams that the transmitted signals are separable, only that they are separated. At a minimum, nobody ordinarily skilled in the art would confuse the "separated signals" of Williams for "separable signals" as are currently claimed.

3. <u>Conclusion on Anticipation</u>

Accordingly, the rejections of claims 4-5, 7-9, 14-16, 20-21, 23-24, and 27 for anticipation fail on two independent grounds. The Office failed to properly establish *prima facie* anticipation. *Ex parte Levy*, 17 U.S.P.Q.2d (BNA) 1461, 1462 (Pat. & Tm. Off. Bd. Pat. App. & Int. 1990). And the cited reference fails to teach all the limitations of the claims as is required for anticipation, M.P.E.P. §2131; *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990).

B. CLAIMS 2-3 AND 18-19 ARE UNOBVIOUS OVER WILLIAMS, ALTES, & ASHLEY IN COMBINATION

The Office rejected claims 2-3 and 18-19 as obvious under 35 U.S.C. §103(a) over U.S. Letters Patent 5,359,575 ("Williams") in combination with "Radar/Sonar Acceleration Estimation with Linear Period Modulated Waveforms" by R. A. Altes ("Altes") and "Own Doppler Nullification (ODN) in Sonars Using Linear Period Modulated (LPM) Wideband Signals" by Ashley, *et al.* ("Ashley"). These rejections fail because the combinations do not teach all the limitations of the claims. Furthermore, the secondary references are outside the scope and content of the prior art, which also means that the references are not properly combinable.

1. <u>The Cited Art Fails to Teach All the Limitations of the Claims</u>

As noted above, each of the independent claims 1 and 17 now recite "a plurality of separable, modulated Doppler invariant signals". Claims 2-3 and 17-18 incorporate this limitation as a matter of law by virtue of their dependence. 35 U.S.C. §112, ¶4. Williams does not teach this limitation as is established above. Neither Altes nor Ashley remedies this deficiency. Indeed, the Office does not even allege that Altes or Ashley teach the subject limitation. To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. M.P.E.P. §706.02(j); *In re Royka*, 180 U.S.P.Q. (BNA) 580 (CCPA 1974). The art of record therefore fails to render obvious any of claims 2-3 and 18-19.

2. Altes and Ashley Are Outside the Scope and Content of the Prior Art

Altes and Ashley are also outside the scope and content of the prior art. A reference can be asserted against the claimed invention under §103 only if (1) it is within Applicant's field of endeavor, or (2) is reasonably pertinent to the problem facing Applicant even though not within Applicant's field of endeavor. *In re Clay*, 23 U.S.P.Q.2d (BNA) 1058, 1060 (Fed. Cir. 1992).

The present invention as claimed is directed to determining the position of survey components during deployment of a seismic survey through acoustic ranging. Both Altes (p. 914, col. 2, lines 3-6) and Ashley (p, 570, col. 1, lines 2-7) concern SONAR/RADAR detection of underwater targets. It is also clear in context that the techniques are intended for application in a military context. Thus, they are not within Applicants' field of endeavor.

This leaves the question of whether Altes and Ashley are "reasonably pertinent to the problem facing Applicant".

> A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem. Thus, the purposes of both the inventor and the prior art are important in determining whether the reference is reasonably pertinent to the problem the invention attempts to solve. If a reference disclosure has the same purpose as the claimed invention, the reference relates to the same problem, and that fact supports use of that reference in an obviousness rejection. An inventor may well have been motivated to consider the reference when making his invention. If it is directed to a different purpose, the inventor would accordingly have less motivation or occasion to consider it.

Clay, 23 U.S.P.Q.2d (BNA) at 1060.

It is apparent from Applicants' specification that the problem driving the development of the present invention was the degradation of cross-correlation estimates in estimating the position of survey components. (¶[0004]-¶[0005]) Altes and Ashley, as was noted above, are directed to SONAR/RADAR in detection of targets in a military context. There are fundamental differences between the use of acoustic signals in a military context and in a seismic survey. For example, in a military context, it is not actually known *a priori* that a target is present. But, more importantly, ranging is of secondary importance in a military context, coming into play only after detection. Thus, in the military context, the signal travels relatively great distances to locate a target whose presence is unknown *a priori* and if, and only if, detection occurs, ranging follows.

This is a distinctly different operational scenario from that found in seismic surveying, in which the presence of the survey components is known within some also known distance and the whole point is ranging.

Other facts about Altes and Ashley may be discerned from the face of the references that support the fact that they are outside the scope and content of the prior art. Altes was published in the *IEEE Transactions on Aerospace and Electronic Systems*, hardly a source to which a seismic surveyor would turn. The author's bio indicates that Altes worked for a variety of defense contractors, who are also not known for their interest in seismic surveying. Ashley was published in the *IEEE Pacific Rim Conference on Communications, Computers and Signal Processing*, again a publication not likely recommended to those in seismic surveying.

Thus, Altes and Ashley are outside the scope and content of the prior art. They are not within Applicants' field of endeavor and they are not reasonably pertinent to the problem confronting Applicants. The Office has provided no reason why those in the art of seismic surveying would look to military applications of SONAR and RADAR, and no cross-referencing of the fields is apparent from the evidence of record. Indeed, the evidence gleaned from the references themselves would actually support the opposite conclusion—that those in the art of seismic surveying would not look to references such as Altes and Ashley.

The Office disputes Applicants' position that Altes and Ashley are outside the scope and content of the prior art. The Office more particularly states:

> It is difficult to see how a sonar application is outside the scope and content of underwater pulse tracking (Williams et al). In fact the secondary references and Williams are directed acoustic pulse transmissions or sonar.

("final" Office Action dated April 4, 2008, "Detailed Action", p. 4, ¶6) The Office makes a common mistake by defining too broadly the problem facing the inventor while doing the same for the cited art and then erroneously pegs the relevance of the secondary references to the primary reference instead of the claimed invention.

As previously noted, a reference can be asserted against the claimed invention under §103 only if (1) it is within *Applicant's* field of endeavor, or (2) is reasonably pertinent to the problem facing the *Applicant* even though not within *Applicant's* field of endeavor. *In re Clay*, 23 U.S.P.Q.2d (BNA) 1058, 1060 (Fed. Cir. 1992). Thus, the pertinence of Altes and Ashley to Williams is immaterial. It is their pertinence to the *invention* that is relevant. Furthermore, by

arguing their relevance, the Office impliedly concedes the proposition that the secondary references are not within Applicants' field of endeavor. The Office does not challenge this proposition, at any rate.

But the Office primarily errs in defining the problem confronting Applicants too broadly. As previously asserted, the present invention as claimed is directed to determining the position of survey components during deployment of a seismic survey through acoustic ranging. The Office apparently now asserts the problem to be much broader—namely, "acoustic pulse transmission". Under this definition, the generation of sonic booms by exceeding the sound barrier would ostensibly be "reasonably pertinent" to the present invention. This is clearly not the case, but highlights the error that can arise from defining the Applicants' problem too broadly.

This error is frequently seen in decisions of the Court of Appeals for the Federal Circuit, its predecessor, of the Board of Patent Appeals and Interferences. *See, inter alia, Clay*, 23 U.S.P.Q.2d (BNA) at 1060; *In re Pagliero*, 210 U.S.P.Q. (BNA) 888 (CCPA 1981); *Ex parte Dussaud*, 7 U.S.P.Q.2d (BNA) 1818, 1819 (Bd.Pat.App.Int. 1988). These kinds of decisions also illustrate the error that can arise from defining the problem too broadly based on the underlying technical principles.

Applicants point to the decision in *In re Pagliero*, 210 U.S.P.Q. (BNA) 888 (CCPA 1981). In *Pagliero*, the Applicant claimed a "method for producing a decaffeinated vegetable material." *Id.*, at 888. One of the secondary references taught a "lipoid theory" of narcotics. *Id.*, at 889-90. As a part of that theory, the secondary reference taught that caffeine is soluble in fatty materials. *Id.*, at 891. The Board had construed the relevant art broadly as "decaffeination" processes. *Id.* In reversing the Board and holding that the secondary reference was nonanalogous, the court stated that:

> Our determination here is not without difficulty. However, we think the difficulty arises from not considering the subject matter as a whole and instead focusing on the scientific principle involved....

Id. at 892, quoting *In re Van Wanderham*, 154 U.S.P.Q. (BNA) 20, 25 (C.C.P.A. 1967).

The court's decision in *Clay* is also instructive. In addressing the first part of the test for analogous art, the Federal Circuit reasoned:

> The PTO argues that [the reference] and [Applicant's] inventions are part of a common endeavor—"maximizing

> withdrawal of petroleum stored in petroleum reservoirs." However, [the reference] cannot be considered to be within [Applicant's] field of endeavor merely because both relate to the petroleum industry. ...[Applicant's] field of endeavor is the *storage* of refined liquid hydrocarbons. The field of endeavor of the [reference], on the other hand, is the *extraction* of crude petroleum. The Board clearly erred in considering [the reference] to be within the same field of endeavor as [Applicant's].

Clay, 23 U.S.P.Q.2d (BNA) at 1060. This reasoning reads directly on the present case with only slight modification for the technologies involved. With respect to the second part of the test, the Federal Circuit, after a discussion of the two inventions, held:

> A person having ordinary skill in the art would not reasonably have expected to solve the problem of dead volume in tanks for storing refined petroleum by considering a reference dealing with plugging underground formation anomalies. The Board's finding to the contrary is clearly erroneous.

Clay, 23 U.S.P.Q.2d (BNA) at 1061.

Thus, the Office's error lies in equating the problem confronting the inventors with the underlying scientific principle—*i.e.*, acoustic pulse transmission rather than determining the position of survey components during deployment of a seismic survey through acoustic ranging. As in *Clay*, *Pagliero*, and *Dussaud*, this has led to the consideration of art that is outside the scope and content of the prior. The Office's difficulty in seeing that Altes and Ashley are not relevant arises from the fact that it has framed the analysis improperly. Once the analysis is properly structured, the error in the Office's position becomes clear.

3. <u>Conclusion on Obviousness</u>

Applicants therefore respectfully submit that the rejections are erroneous. The art of record does not teach all the limitations of the claims, and therefore cannot render the claims obvious. M.P.E.P. §706.02(j); *In re Royka*, 180 U.S.P.Q. 580 (CCPA 1974). The secondary references are outside the scope and content of the prior art such that they are not properly citable against the present claims. *In re Clay*, 23 U.S.P.Q.2d (BNA) 1058, 1060 (Fed. Cir. 1992). The art of record therefore fails to render obvious any of claims 2-3 and 18-19.

C. CONCLUSION OF THE ARGUMENT

Applicants therefore respectfully submit that the claims 1-5, 7-21, and 23-27 are allowable over the art of record. For both anticipation and obviousness, the art of record must teach or suggest all the limitations of the claims. As Applicants established above, none of the art, whether alone or in combination, teach or suggest "a plurality of separable, modulated Doppler invariant signals". Furthermore, in the anticipation rejections, the Office failed to identify where in the primary reference the limitations of the dependent claims are disclosed and, in the obviousness rejections, the secondary references are outside the scope and content of the prior art. Applicants therefore request that the rejections be REVERSED.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal—claims 1-5, 7-21, and 23-27—are set forth in the attached "Claims Appendix." The listing assumes that the amendment submitted after the "final" rejections was not entered as discussed above in Section IV, entitled "Status of Amendments".

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATED PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

Applicant therefore respectfully submits that the claims are allowable over the art of record. Accordingly, Applicant request that the rejections be REVERSED and the claims allowed to issue.

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Respectfully submitted,

Date: January 15, 2009

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APPENDIX
(Claims in Issue)

1. An apparatus for determining a propagation time delay, comprising:
at least one source adapted to generate a plurality of separable, modulated Doppler invariant signals;
at least one receiver deployed along a seismic sensing cable, wherein the receiver is adapted to receive at least one modulated Doppler invariant signal from the at least one source; and
a signal processing unit adapted to determine the propagation time delay between the source and the receiver using the modulated Doppler invariant signal and the received modulated Doppler invariant signal.

2. The apparatus of claim 1, wherein the modulated Doppler invariant signals are modulated linear-period-modulated signals.

3. The apparatus of claim 2, wherein the modulated linear-period-modulated signals have a bandwidth of about 16 kHz and a temporal duration of about 0.25 seconds.

4. The apparatus of claim 1, wherein the signal processing unit is adapted to determine the propagation time delay between the source and the receiver by cross-correlating one of the modulated Doppler invariant signals and the received modulated Doppler invariant signal.

5. The apparatus of claim 4, wherein the signal processing unit is adapted to determine the propagation time delay between the source and the receiver by auto-correlating the modulated Doppler invariant signal.

6. (Canceled)

7. The apparatus of claim 1, wherein the at least one source is adapted to generate the plurality of separable Doppler invariant signals as a plurality of orthogonal Doppler invariant signals.

8. The apparatus of claim 7, wherein the at least one source is adapted to generate the plurality of orthogonal Doppler invariant signals using a plurality of orthogonal sequences.

9. The apparatus of claim 8, wherein the plurality of orthogonal sequences are at least one of a plurality of Maximal sequences and a plurality of Kasami sequences.

10. The apparatus of claim 1, wherein the at least one source is adapted to generate the plurality of separable Doppler invariant signals substantially simultaneously.

11. The method of claim 1, wherein the at least one source is adapted to generate the plurality of separable Doppler invariant signals with a time delay between each of the plurality of separable Doppler invariant signals.

12. The apparatus of claim 1, wherein the at least one source is a first source adapted to generate the plurality of separable Doppler invariant signals.

13. The apparatus of claim 1, wherein the at least one source is a plurality of physically separate sources adapted to generate the plurality of separable Doppler invariant signals.

14. The apparatus of claim 1, wherein the signal processing unit is adapted to determine a distance between the source and the receiver using the propagation time delay.

15. The apparatus of claim 1, wherein the at least one source is deployed near the surface of a body of water.

16. The apparatus of claim 15, wherein the at least one source is deployed on at least one of a buoy, a vessel, and a towed cable.

17. A method for determining a propagation time delay, comprising:

generating a plurality of separable, modulated Doppler invariant signals using at least one source;

receiving the at least one modulated Doppler invariant signal with at least one receiver positioned along a seismic cable; and

determining at least one propagation time delay from the source to the receiver using the modulated Doppler invariant signal and the received Doppler invariant signal.

18. The method of claim 17, wherein generating the separable, modulated Doppler invariant signals comprises generating a linear-period-modulated signal.

19. The method of claim 18, wherein generating the linear-period-modulated signal comprises generating the linear-period-modulated signal having a bandwidth of about 16 kHz for about 0.25 seconds.

20. The method of claim 17, wherein determining the propagation time delay from the source to the receiver using the separable, modulated Doppler invariant signals and the received Doppler invariant signal comprises cross-correlating the modulated Doppler invariant signal and the received Doppler invariant signal.

21. The method of claim 17, wherein determining the propagation time delay from the source to the receiver using the separable, modulated Doppler invariant signals and the received Doppler invariant signal comprises auto-correlating the modulated Doppler invariant signal.

22. (Canceled)

23. The method of claim 1, wherein generating the separable, modulated Doppler invariant signals comprises generating a plurality of orthogonal Doppler invariant signals.

24. The method of claim 23, wherein generating the plurality of orthogonal Doppler invariant signals comprises generating the plurality of orthogonal Doppler invariant signals using at least one of a Maximal sequence and a Kasami sequence.

25. The method of claim 17, wherein generating the plurality of separable, modulated Doppler invariant signals comprises generating the plurality of separable Doppler invariant signals substantially simultaneously.

26. The method of claim 17, wherein generating the plurality of separable, modulated Doppler invariant signals comprises generating the plurality of separable Doppler invariant signals with a time delay between each of the plurality of separable Doppler invariant signals.

27. The method of claim 17, further comprising determining at least one distance from the source to the receiver using the at least one propagation time delay.